**Cellular Biology Unit Culminating Task**

The culminating task for this unit will be spread over a three day period. The following is a breakdown of how the three days will run and how students will be assessed:

**Day 1:** Independent student review day based on review questions/definitions given. By the end of the

day this should be complete if not in class then at home for homework.

**Day 2:** **Jeopardy Review Game**

* All the questions will be based on yesterday’s review
* Point system/Questions
  + All questions used are from yesterday’s review sheet
  + Take a sheet of paper and cut it up into how many questions you’d like to use and place a number on it. This will correspond to the amount of review questions used.
  + Next cut out another 10 squares, label on each piece a number from 100- 800 and write a double jeopardy and triple jeopardy (this is your point system)
    - Double jeopardy means you double the point value
    - Triple jeopardy means you triple the point value
  + Keep these two piles separate
  + Students will determine which the questions are asked by choosing one representative to come up to the front of the class and pick a question and a point value.
  + The teacher will then read the question out twice and tell the students the value.
* Set up/ Rules
  + Divide students into groups of 3 and spread out around the room
  + Give each group a type of noise maker (whistle, clap, bell, etc.)
  + Only one student per group is allowed to make the noise. If more than one student goes for the noise maker they will be disqualified. This is to prevent animosity amongst group members, arguments with others, etc.
  + After the question is read out, the teacher does a three second count down to let students converse about the question and be ready to respond. NO noise is permitted before the countdown. Failure to follow this rule will also lead to disqualification for the question. This ensures equality and early noise making.
  + After the count down, the group has 10 seconds to answer the question. Failure to do so correctly will result in half the point value being taken away from the groups score. It is possible to have a negative score.
  + When a question is answered incorrectly, it goes back to the countdown performed by the teacher and the other groups have a chance to answer it for half the points. The points keep getting halved until no points are left (in which case teacher goes over the answer) or the students answer it correctly.

**Day 3:** **Bell ringer**

* Students will come into class the room will be set up with station cards.
* Place the rest stations aprox. every two stations to give students the chance to catch up on stations.
* Students will leave their backpacks in their lockers as instructed the previous day. If they forget to do this, find a spot in the back of the room where all the bags can be piled together.
* As students walk in they will be given their answer sheet where they can write their name and date on it.
* They will all go to one of the stations where there is a card flipped over. This is done individually!!!
* Students will have approximately 2.5 minutes per stations with 10 seconds to get from station to station. If organization takes longer adjust station time.
* Give students a 30 second warning so that they can finish up and are aware of the time.
* Tell students time and have them rotate around the room until they are done all the stations.
* Students are not allowed to go back to other stations at the end.
* Collect all answer booklets at the end and mark.

**PART A:**

1. What is the cell theory? What does it state? Who said what throughout the discovery?
2. What is the basic unit of life?
3. What are the characteristics of living things?
4. What are the parts of the cell? Define each one and know to label, define and understand each.
5. What is passive transport? Why is it important?
6. What are the three different categories of passive transport?
7. Compare and contrast passive vs active transport.
8. What is active transport? Why is it important?
9. What is the photosynthesis equation? MEMORIZE
10. What is ATP? Why is it like a rechargeable battery?
11. What is respiration?
12. How are respiration and photosynthesis the same? Why is this important?
13. How is food converted to ATP? What are the two different situations?
14. What is the enzyme substrate model/theory? Why is this important?
15. Why are enzymes so important in our bodies?
16. Describe each one of the macronutrients (fats, carbs, vitamins, etc.) Know them.
17. Compare plant and animal cells, how are they different?
18. How would you prepare a wet mount? What are the advantages of a wet mount slide?
19. What is the effect of temperature on the rate of diffusion of molecules across a membrane? What does this occur?

**Part B:**

1. What is the cell theory? What does it state? Who said what throughout the discovery?
2. What is the basic unit of life?
3. What are the characteristics of living things?
4. What are the parts of the cell? Define each one and know to label, define and understand each.
5. What is passive transport? Why is it important?
6. What are the three different categories of passive transport?
7. Compare and contrast passive vs active transport.
8. What is active transport? Why is it important?
9. What is the photosynthesis equation? MEMORIZE
10. What is ATP? Why is it like a rechargeable battery?
11. What is respiration?
12. How are respiration and photosynthesis the same? Why is this important?
13. How is food converted to ATP? What are the two different situations?
14. What is the enzyme substrate model/theory? Why is this important?
15. Why are enzymes so important in our bodies?
16. Describe each one of the macronutrients (fats, carbs, vitamins, etc.) Know them.
17. Go over the nutrition activity and handout.

**Part C:**

1. What are the two types of cellular respiration? What are the similarities and differences between the two types of respiration?
2. Write a chemical equation that describes what happens during aerobic respiration.
3. What happens during glycolysis? Does this happen only in one type of respiration or does it happen in both?
4. What is pyruvate and what happens to it during aerobic and anaerobic respiration?
5. Which method of respiration is more efficient? Why?
6. Why would our bodies have two types of respiration? How could this benefit us?
7. Compare and contrast the health benefits to exercising at the “aerobic threshold” zone and at the “anaerobic threshold” zone.

Date: Name:

**Cellular Biology Culminating Task – Answer Sheet**

|  |  |
| --- | --- |
| **Station #** | **Your Answer** |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |

|  |  |
| --- | --- |
| **Station #** | **Your Answer** |
| 6 |  |
| 7 |  |
| 8 |  |
| 9 |  |
| 10 |  |
| **Station #** | **Your Answer** |
| 11 |  |
| 12 |  |
| 13 |  |
| 14 |  |
| 15 |  |
| **Station #** | **Your Answer** |
| 16 |  |
| 17 |  |
| 18 |  |

**Your Mark:**

**Comments:**

(10 marks)

At this station there is a cell model. The model will show the interior of the cell with five organelles that will have a taped numbered arrow pointing at them.

Your task is to name these organelles on the sheet provided. The sheet will have numbers 1 to 5.

1. Write the corresponding number on the sheet to the arrow pointing to the specific organelle.
2. State the function of each organelle.

(6 marks)

What organelles are involved in protein synthesis? What is the function of each organelle in the making of a protein?

(4 marks)

Compare and contrast active transport to passive transport.

(4 marks)

List four differences between plant and animal cells.

(4 marks)

List the steps used to prepare a wet mount.

(2 marks)

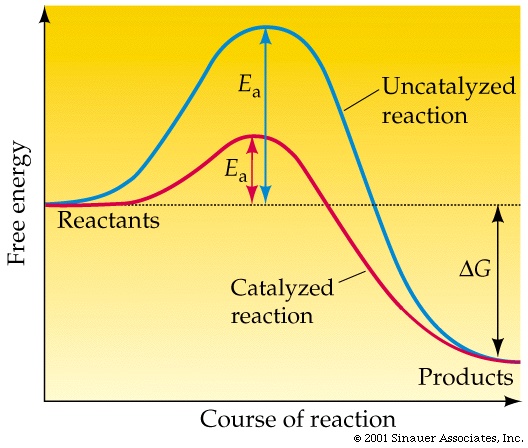
If the temperature is increased, how will this affect the rate of diffusion across a membrane? Why?

**(3 marks)**

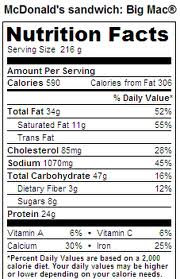
Match the following enzymes to the potential enzyme application.

|  |  |
| --- | --- |
| Enzyme | Description |
| 1. Amylase | 1. Milk |
| 1. Lactase | 1. Fabric Softener |
| 1. Cellulase | 1. Sugar |

1. Explain what the following graph is an example of. (1 mark)
2. What would happen to this reaction if the temperature was too low? (2 marks)



1. In the enzyme substrate model, why does only one substrate code for one enzyme? (2 marks)
2. In four steps, draw out the process and describe what is happening with one word. (2 marks)
3. Is the following food label showing a un/healthy food? (1 mark)
4. How can you tell? Use specific examples from the label. (2 marks)

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Billy Bob went to his doctor the other day because he was having a hard time doing number 2 (producing stool). He told the doctor he goes once MAYBE twice a week.

1. What might the doctor have told him to do? (hint: not laxatives) (1 mark)
2. Why would he have told him to do this? What does it do to the stool?

(2 marks)

1. Why is this unhealthy for his digestive tract especially his colon? (1 mark)

(3 marks)

Why are fab diets such as the Atkins diet, the cabbage soup diet or the grapefruit diet not a successful weight loss system? What would you tell a person who is in this boat to persuade them to see your point?

(4 marks)

Explain 4 major differences between aerobic and anaerobic respiration.

(3 marks)

During aerobic respiration, glucose and oxygen is consumed and carbon dioxide and water is produced, along with ATP. Below is a partially correct chemical equation for what happens during aerobic respiration.

What is incorrect about the chemical equation below? Please correct it.

C6H12O6  + O2 🡪 CO2  + H2O

(4 marks)

1. Describe what happens during glycolysis.
2. Does this reaction take place during aerobic respiration or anaerobic respiration?

(5 marks)

1. What is pyruvate?
2. What happens to pyruvate during aerobic respiration?
3. What happens to pyruvate during anaerobic respiration?

(4 marks)

1. Which type of respiration is more efficient? Why?
2. What might be the reason for evolution to maintaining both types of respiration if one method is much for efficient than the other?

(4 marks)

When you are working out, what are the health benefits of exercising at the “aerobic threshold” zone? What are the health benefits of exercising at the “anaerobic threshold” zone?

**ANSWER KEY for Bell Ringer Activity**

**Station 1 Answers:**

1. Mitochondria – produces ATP, the energy required by the cell
2. Nucleus – the “brain” of the cell, directs all cell processes
3. Ribosomes – involved in protein synthesis, transcription
4. Vacuole – stores nutrients and water
5. Lysosomes – contains digestive enzymes, as well, acts to destroy any foreign objects that may enter the cell

**Station 2 Answers:**

The following organelles are involved in protein synthesis,

1. Ribosomes – produces the amino acid chain from mRA
2. Endoplasmic Reticulum – the rough ER packages the protein in to sacs, called cisternae, the protein is then sent to the golgi bodies
3. Golgi Bodies – modifies the proteins to produce an active molecule, the golgi bodies also transports the proteins to specific areas in the cell

**Station 3 Answers:**

Active transport requires the use of ATP and molecules are pumped against the concentration gradient. In comparison, passive transport involves the movement of molecules from an area of high concentration to an area of low concentration (diffusion), no ATP is required.

**Station 4 Answers:**

* 1. Plant cells have a cell wall
  2. Plant cells have one large vacuole
  3. Plant cells are rectangular shaped, animal cells have an irregular shape
  4. Plant cells contain chloroplast for photosynthesis, animal cells do not contain chloroplast

**Station 5 Answers:**

1. Place the specimen on the slide
2. Place a drop of water on the specimen
3. Put on a cover slip
4. View under a microscope

**Station 6 Answers:**

As temperature increases, the rate of diffusion of molecules across a membrane will also increase. This occurs because as temperature increases molecules begin to move faster, according to particle theory.

**Station 7 Answers:**

A) 3

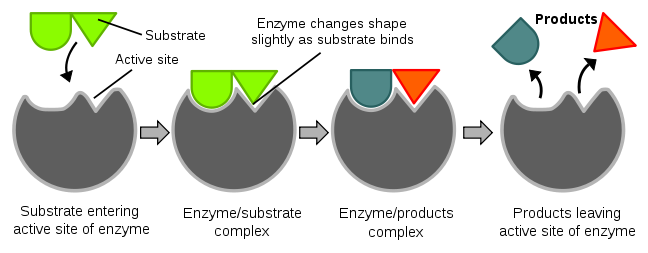
B) 1

C) 2

**Station 8 Answers:**

1. This is an example of an enzyme catalyzed reaction.
2. If the temperature was too low then the reaction will not happen as fast because enzymes only work in optimal conditions.

**Station 9 Answers:**

1. One substrate codes for one enzyme because every substrate and enzyme have specific shapes into which they fit like a lock and key. Only when there is a perfect fit will they bind and react.
2. 

**Station 10 Answers:**

Based on the food label the food is unhealthy because the fat content is too high is over 50% of daily intake in one food type, lots of saturated fat which can lead to heart disease and very high in sodium which increase cholesterol and blood pressure.

**Station 11 Answers:**

1. Billy Bob’s doctor would probably tell him to eat a lot more fibre in his diet.
2. This would loosen up the stool and make it easier for him to pooh more often.
3. The effect that this may have on him in the long run is colon cancer or digestive tract problems.

**Station 12 Answers:**

Fab diets are not successful because they are not a balanced diet. They do not incorporate all the major food groups that our body needs to successfully function. Our body needs roughly 60% carbs, 30% protein and 10% fat. These values may fluctuate a bit from person to person but you need all these to have a balanced and healthy diet.

**Station 13 Answers:**

1. Aerobic respiration requires oxygen whereas anaerobic respiration does not require oxygen.
2. 36 ATP are produced during aerobic respiration and only 2 ATP are produced during anaerobic respiration
3. Aerobic respiration takes place in both the cytoplasm of the cell and the mitochondria, whereas anaerobic respiration does not take place in the mitochondria.
4. Aerobic respiration produces carbon dioxide and water as waste, whereas anaerobic respiration produces lactic acide as waste.

**Station 14 Answers:**

C6H12O6 + **6** O2 🡪 **6** CO2 + **6** H2O

**Station 15 Answers:**

1. During glycolysis, a series of 10 enzyme-catalyzed reactions break down one molecule of glucose (C6H12O6) into two molecules of pyruvate (C3H6O3) and two ATP are produced.
2. This takes place during both aerobic and anaerobic respiration.

**Station 16 Answers:**

1. Pyruvate is the molecule that is produced from glucose during glycolysis.
2. During aerobic respiration, the pyruvate goes into the mitochondria and oxygen is used to break it down into carbon dioxide and water producing 34 ATP.
3. During anaerobic respiration, the pyruvate stays in the cytoplasm and an enzyme called lactate dehydrogenase converts it into lactic acid. No ATP is produced.

**Station 17 Answers:**

1. Aerobic respiration is much more efficient because 36 ATP are produced with one molecule of glucose compared to 2 ATP being produced during anaerobic respiration.
2. Both methods are probably kept in evolution because although aerobic respiration is more efficient, anaerobic respiration has benefit as well. During a time where oxygen is lacking, like when an animal is quickly trying to run away from a predator, the ability to perform anaerobic respiration to produce more ATP would help give that animal the needed extra energy to get away from its predator.

**Station 18 Answers:**

Exercising at the aerobic threshold zone maximises your calorie burning effort. It can improve the number and size of blood vessels in both the respiratory and cardiac functions. It also releases Endorphins, which is a natural “feel good” hormone. You build resistance to fatigue and increase your endurance. Exercising at the anaerobic threshold zone builds your tolerance to lactic acid. It greatly improves fitness and sports performances for individuals who are already fit.